CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9701 CHEMISTRY

9701/35 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Question	Sections	Indicative material	Mark	Total
1 (a)	PDO *Recording*	Table **completed** and all temperatures recorded to 0.5°C. Must include at least one ending in .0 and one ending in .5.	1	[1]
(b) (i)	PDO *Layout*	Axes labelled temperature or T / °C or (°C) or temperature in °C (*y-axis*) and time (*x-axis*) or t / minutes etc. Linear scales chosen so that graph occupies at least half the available length of both axes. This includes the 5°C extension.	1	
(ii)	PDO *Layout*	Plotting accurate to within half a small square. Must plot all readings taken – minimum 8.	1	
	MMO *Collection*	2 straight lines drawn (0 to 3 minutes and 5 to 10 minutes).	1	
	PDO *Layout*	3 appropriate lines drawn including extrapolations.	1	[4]
(c) (i)	ACE *Interpretation*	ΔT calculated. Examiner to check from graph and calculate to nearest .5 °C. Candidate's answer must be correct to nearest .5 °C. dp not needed for .0 but can include more sf if appropriate. Allow ΔT at 3 ½ minutes, even if not max, provided some indication on graph.	1	
(ii)	ACE *Conclusions*	All the magnesium disappeared / reacted / dissolved / gone. Must include idea of totality. (NOT stops fizzing)	1	
(iii)	ACE *Interpretation*	Error in one temperature reading = 0.5 (°C)	1	
		Maximum % error = 0.5 × 2 / 7.5 × 100 = 13.3% (ecf 2 × error). Expression or correct answer but conditional on answer to 1 reading.	1	
(iv)	ACE *Improvement*	Heat loss **and** add lid/cover/ top. (allow thermos flask)	1	
(v)	ACE *Conclusions*	ANY 2 from Higher (initial and) **final/ maximum** temperature / **all** temperatures higher. (not temperatures higher)	1 1	
		No effect on ΔT.		
		Maximum temperature rise achieved quicker / reacts faster.		[7]
				[Total:12]

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2 (a)	MMO *Collection*	**I** Mass of FA 3 used between 1.3 and 1.5 g. Subtraction must be correct from unambiguous weighings.	1	
	PDO *Layout*	**II** Records initial and final burette readings and titre for rough. Tabulates and records initial and final burette readings and volume of FA 2 run from burette for all accurate titrations. Not awarded if final is 50 / 50.0 / 50.00 more than once or if 50 etc is used in any initial reading. (One accurate titre is sufficient.)	1	
	PDO *Recording*	**III** Appropriate headings and units in accurate titrations. Only acceptable initial / final (burette) reading / volume or reading or volume at start / finish / beginning / end then volume used/volume added / **FA 2** used / titre. Units are /cm^3, (cm^3) or volume in cm^3.	1	
	PDO *Recording*	**IV** All burette readings, apart from the rough, recorded to 0.05 cm^3 (this includes 0.00). Two (minimum) accurate titrations needed.	1	

Examiner to check subtractions, round any burette reading to nearest 0.05 cm^3 and then select the best titre using the hierarchy, two identical; two within 0.05 cm^3, two within 0.1 cm^3 etc., to calculate mean. This Examiner's value should be compared with Supervisor's mean titre taking into account the masses used by the Supervisor and the candidate.
Candidate titre x Supervisor mass/ candidate mass.

The candidate number, candidate's titre, difference from the Supervisor and mark awarded should be recorded on the template. This should be attached securely to the Supervisor's script.

	MMO *Quality*	**V, VI and VII** Award **V**, **VI** and **VII** for a mean within 0.20 cm^3. Award **V** and **VI** for a mean $>$0.20 and $\leqslant$0.40 cm^3. Award **V** for a mean $>$0.40 and $<$0.60 cm^3. **Spread penalty** Titres (selected by Examiner) differ by ≥ 0.5 or only one accurate titration –1. This mark is deducted from those awarded in V to VII but no negative marks.	3	[7]
2 (b)	PDO *Display*	Calculation of mean. Candidate must average two (or more) accurate titres that are within 0.20 cm^3 of another. Working must be shown or ticks must be put next to the two (or more) accurate readings selected.	1	

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		The mean should normally be quoted to 2 dp rounded to the nearest 0.01. Example: 26.667 must be rounded to 26.67. *Two special cases where the mean may not be to 2 dp:* *allow mean to 3 dp only for 0.025 or 0.075 e.g. 26.325;* *allow mean to 1 dp if **all** accurate burette readings were given to 1 dp and the mean is exactly correct. e.g. 26.0 and 26.2 = 26.1 is correct but 26.0 and 26.1 = 26.1 is incorrect.* *Do **not** award this mark if:* *any selected titre is not within 0.20 cm^3 of any other selected titre;* *the rough titre was used to calculate the mean;* *the candidate carried out only 1 accurate titration;* *burette readings were incorrectly subtracted to obtain any of the accurate titre values.* *Note: the candidate's mean will sometimes be marked as correct even if it is different from the mean calculated by the Examiner for the purpose of assessing accuracy.*		[1]
2 (c) (i)	PDO *Display*	Working shown; mass/106 is minimum required.	1	
	ACE *Interpretation*	$\frac{\text{Candidate's mass of sodium carbonate}}{106 \times 10}$ Answer correctly calculated to 3 to 4 sf. Allow ecf for transcription error in mass or incorrect M_r but not if volume included.	1	
(ii)	ACE *Conclusions*	Correct use of 2.	1	
	ACE *Interpretation*	Correct calculation of concentration $\frac{\textbf{(i)} \times 2 \times 1000}{\textbf{(b)}}$ (3 to 4 sf) Ecf possible for no 2 or incorrect use of 2.	1	
(iii)	ACE *Conclusions*	Expression or correct answer to **(c)(ii)** × 20 (3 to 4 sf only if 20 not shown). Penalise incorrect sf only once.	1	[5]
				[Total: 13]

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FA 4 is $CuCl_2(aq)$; **FA 5** is $KMnO_4(aq)$; **FA 6** is $MnSO_4(aq)$; **FA 7** is MnO_2.

3 (a) (i)	MMO *Collection*	Solution / **FA 4** / liquid goes from blue to green or green-yellow / yellow-green.	1	
		(Pale) blue precipitate formed AND dissolves to dark / royal blue solution (not dark / deep blue ppt).	1	
		White precipitate.	1	
		Brown / qualified brown / precipitate / solution (not red-brown or orange) AND goes blue-black or dark blue or black (solution or solid).	1	
(ii)	ACE *Conclusions*	**FA 4** is copper(II) chloride (one piece of evidence needed for Cu^{2+} and Ag^+ test for Cl^-).	1	
(iii)	ACE *Conclusions*	**Iodide** was oxidised (to iodine)/ KI oxidised to iodine / iodine was formed with evidence / KI oxidised needs evidence of iodine. (not iodide is a reducing agent)	1	[6]
(b) (i)	MMO *Collection*	Solution **/** $FeSO_4$ / liquid goes from green to yellow / green to colourless / stays colourless (not no change). Solution / **FA 5 /** liquid goes from purple to colourless / purple to yellow. (penalise no solution or initial colour only once in **(a)(i)** and **(b)(i)**)	1	
		Buff / off-white / light brown / beige precipitate.	1	
		Goes brown / goes darker brown / black **and** bubbles / fizzing / (it/gas) relights glowing splint.	1	
		White precipitate AND insoluble in dilute acid.	1	
	MMO *Decisions*	**Fizzing/bubbles/effervescence and** relights a glowing splint (or gas test in point above).	1	
(ii)	ACE *Conclusions*	Conclusion**: FA 6** is manganese(II) (needs II) (with obs to show some evidence) sulfate (with obs to show some evidence).	1 1	
		Uses NaOH(aq) or NH_3(aq).	1	
(iii)	MMO *Decisions*	Red-brown / orange-brown / dark brown / rust precipitate formed (not red).	1	
	ACE *Improvements*			[9]
				[Total: 15]

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